

Linux

HP StorageWorks Disk Array XP operating system configuration guide

XP48
XP128
XP512
XP1024
XP12000

fifth edition (August 2004)

part number: A5951-96092

This guide describes the requirements and procedures for connecting the XP family of disk arrays to a Linux system and configuring the new disk array for operation with Linux.



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HP StorageWorks Disk Array XP Operating System Configuration Guide: Linux

*fifth edition (August 2004)
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About this guide

This guide describes the requirements and procedures for connecting the XP family of disk arrays to a host system, and configuring the disk array for use with a particular operating system.

Intended audience

This guide is intended for system administrators who have knowledge of the following topics:

- Data processing concepts
- Direct access storage device subsystems and their basic functions
- Disk arrays and RAID technology
- Operating system commands and utilities

Disk arrays

Unless otherwise noted, the term *disk array* refers to these disk arrays:

HP Surestore Disk Array XP512
HP Surestore Disk Array XP48
HP StorageWorks Disk Array XP128
HP StorageWorks Disk Array XP1024
HP StorageWorks XP12000 Disk Array

Related documentation

HP provides the following related documentation:

- *HP StorageWorks Disk Array XP128: Owner's Guide*
- *HP StorageWorks Disk Array XP1024: Owner's Guide*
- *HP StorageWorks XP12000 Disk Array: Owner's Guide*

For information about operating system commands and third-party products, refer to the manufacturer's documentation.

Conventions

This guide uses the following text conventions.

Figure 1	Blue text represents a cross-reference. For the online version of this guide, the reference is linked to the target.
www.hp.com	Underlined, blue text represents a website on the Internet. For the online version of this guide, the reference is linked to the target.
literal	Bold text represents literal values that you type exactly as shown, as well as key and field names, menu items, buttons, file names, application names, and dialog box titles.
<i>variable</i>	Italic type indicates that you must supply a value. Italic type is also used for manual titles.
<code>input/output</code>	Monospace font denotes user input and system responses, such as output and messages.
<i>Example</i>	Denotes an example of input or output. The display shown in this guide may not match your configuration exactly.
[]	Indicates an optional parameter.
{ }	Indicates that you must specify at least one of the listed options.
	Separates alternatives in a list of options.

HP technical support

In North America, call technical support at 1-800-652-6672, available 24 hours a day, 7 days a week.

Outside North America, call technical support at the nearest location. Telephone numbers for worldwide technical support are listed on the HP website under support:

<http://h18006.www1.hp.com/storage/arraysystems.html>

Be sure to have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

For continuous quality improvement, calls may be recorded or monitored.

HP storage website

For the most current information about HP StorageWorks XP products, visit the support website. Select the appropriate product or solution from this website:

<http://h18006.www1.hp.com/storage/arraysystems.html>

For information about product availability, configuration, and connectivity, consult your HP account representative.

HP authorized reseller

For the name of your nearest HP authorized reseller, you can obtain information by telephone:

United States 1-800-345-1518

Canada 1-800-263-5868

Or contact: www.hp.com

Revision history

May 1999	First release
November 2000	Added support for XP512.
July 2003	Technical update
August 2004	Updated for XP12000 and other technical and organizational improvements

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Installation

Installation of the HP StorageWorks Disk Array XP is performed by your HP service representative and you. The HP service representative installs the disk array and formats the disk devices. You configure the host server for the new devices with assistance from the HP service representative.

Features and requirements

The disk array and host have the following features and requirements.

- HP StorageWorks disk arrays:
 - XP48:** Up to 48 drives from 72 GB to 8.7 TB, 24 FC ports
 - XP128:** From 8 to 128 drives for up to 18 TB, 48 FC ports
 - XP512:** Up to 512 drives from 72 GB to 93 TB, 48 FC ports
 - XP1024:** From 8 to 1024 drives for up to 149 TB, 64 FC ports
 - XP12000:** Up to 1152 drives for up to 165 TB, 128 FC ports
- Server supported by HP to run Linux. Consult your HP representative for a list of supported servers.
- Red Hat, SuSE, or United Linux. Ask your HP Service Representative about the latest supported kernel versions.
- Host Bus Adapters (HBAs): Install adapters and all utilities and drivers. Refer to the adapter documentation for installation details.
- *(Recommended)* HP StorageWorks Command View XP with LUN management feature or Remote Control with the LUN Configuration Manager XP option for configuring disk array ports and paths.
- *(Recommended)* HP StorageWorks Secure Manager XP: Allows the host to access only array devices for which it is authorized.
- Other available XP Software (some may not apply to your system):
 - HP StorageWorks Business Copy XP
 - HP StorageWorks Continuous Access XP
 - HP StorageWorks Continuous Access Extension XP
 - HP StorageWorks Auto LUN XP
 - HP StorageWorks Data Exchange XP
 - HP StorageWorks Resource Manager XP
 - HP StorageWorks RAID Manager XP
 - HP StorageWorks Cache LUN XP
 - HP StorageWorks Auto Path XP
 - HP StorageWorks Cluster Extension XP
 - HP StorageWorks Performance Advisor XP software

To install the disk array into a Linux system, ensure that the environment conforms to these requirements:

- HP StorageWorks Disk Array XP with Fibre Channel ports
Each disk array Fibre Channel port must have a Fibre Channel loop ID set that is unique within the Fibre Channel loop. All ports are set to a default of 0 by the factory.
- Red Hat, SuSE, or United Linux. Ask your HP Service Representative about the latest supported kernel versions.
- superuser (**root**) login access to the Linux system
- (Recommended) HP StorageWorks Command View XP software
- (Optional) HP StorageWorks Performance Advisor XP software

Fibre Channel interface

The XP48, XP128, XP512, XP1024, and XP12000 disk arrays support these 1 Gbps and 2 Gbps Fibre Channel interfaces:

- Short-wave non-OFC (open fiber control) optical interface
- Multimode optical cables with SC or LC connectors
- Private arbitrated loop (FC-AL) or fabric direct attached
- Fibre Channel switches

Even though the interface is Fibre Channel, this guide uses the term “SCSI disk” because disk array devices are defined to the host as SCSI disks.

Connectivity options

The disk array provides Fibre Channel connectivity, via either a direct connection or using HP StorageWorks SCSI Bridge FC multiplexers and switches.

Device emulation types

The disk arrays support the following device emulation types:

- **OPEN-x devices:** OPEN-x logical units represent disk devices. Except for OPEN-V, these devices are based on fixed sizes. OPEN-V is a user-defined size. Supported emulations include OPEN-3, OPEN-8, OPEN-9, OPEN-E, OPEN-L, and OPEN-V devices.
- **LUSE devices (OPEN-x*n):** Logical Unit Size Expansion (LUSE) allows you to combine 2 to 36 OPEN-x devices to create expanded LDEVs larger than standard OPEN-x disk devices. For example, an OPEN-x LUSE volume created from ten OPEN-x CVS volumes is designated as OPEN-x*10.
- **CVS devices (OPEN-x CVS):** Volume Size Configuration (VSC) defines custom volumes (CVS) that are smaller than normal fixed-sized logical disk devices (volumes). (OPEN-V is a CVS-based custom disk size that you determine. OPEN-L does not support CVS.)
- **LUSE (expanded) CVS devices (OPEN-x*n CVS):** LUSE CVS combines CVS devices to create an expanded device. This is done by first creating CVS custom-sized devices and then using LUSE to combine from 2 to 36 CVS devices. For example, if three OPEN-9 CVS volumes are combined to create an expanded device, this device is designated as OPEN-9*3-CVS.

Number of partitions and their capacities

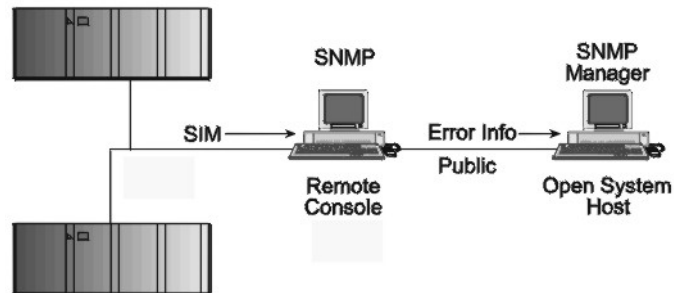
In a Linux environment, one LUN can be divided into a maximum of four primary partitions (using **fdisk**). Instead of primary partitions, you can make a maximum of one extended partition.

Failover

The disk arrays support many standard software products that provide host, application, or I/O path failover and logical volume (storage) management. The XP48, XP128, XP512, XP1024, and XP12000 support the Qlogic I/O path failover functionality, which can be enabled using the driver rpm. Contact your HP Service Representative for more information.

SNMP configuration

The disk arrays support standard Simple Network Management Protocol (SNMP) for remotely managing the disk array from the host. The SNMP agent on the remote console PC or Command View can provide status and Remote Service Information Message (R-SIM) reporting to the SNMP manager on the host for up to eight disk arrays. To configure the SNMP manager on the host, refer to the operating system documentation.



RAID Manager command devices

RAID Manager manages Business Copy (BC) and/or Continuous Access (CA) operations from a server host. To use RAID Manager with BC or CA, you must use Command View or LUN Configuration Manager to designate at least one LDEV as a command device. Refer to the Command View or LUN Configuration Manager user guide for information about how to designate a command device.

Installation procedures

Installation and configuration of the disk array is composed of the following activities:

1. [“Install and configure the disk array” on page 17](#)
 - Setting the Host Mode for the disk array ports
 - Setting the System Option Modes
 - Configuring the Fibre Channel ports
2. [“Install and configure the host” on page 20](#)
 - Loading the OS and software
 - Connecting the Fibre Channel adapters and cabling
 - Installing and configuring the HBAs
 - Verifying new device recognition
3. [“Connect the disk array” on page 23](#)
 - Restarting the Linux server
 - Defining the paths
 - Verifying new device recognition
4. [“Configure disk array devices” on page 27](#)
 - Partition the devices
 - Create the file systems
 - Create the mount directories
 - Create the mount table

Install and configure the disk array

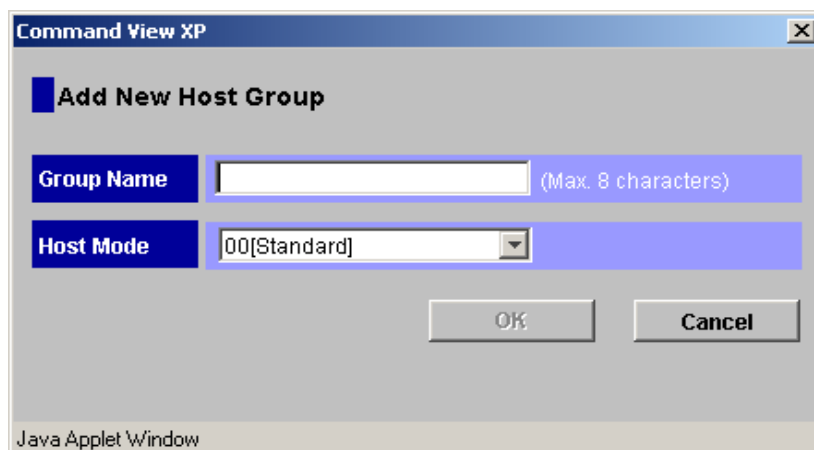
The HP service representative performs the following tasks:

- Assembling hardware and installing software
- Loading the microcode updates
- Installing the channel adapters (CHAs) and cabling
- Installing and formatting devices

You perform the additional tasks below. If you do not have Command View or LUN Configuration Manager, your HP service representative can perform these tasks for you.

Setting the Host Mode for the disk array ports

The disk array ports have Host Modes that you must set depending on the host you use. After the disk array is installed, use Command View (shown) or LUN Configuration Manager to set the Host Mode for each port.

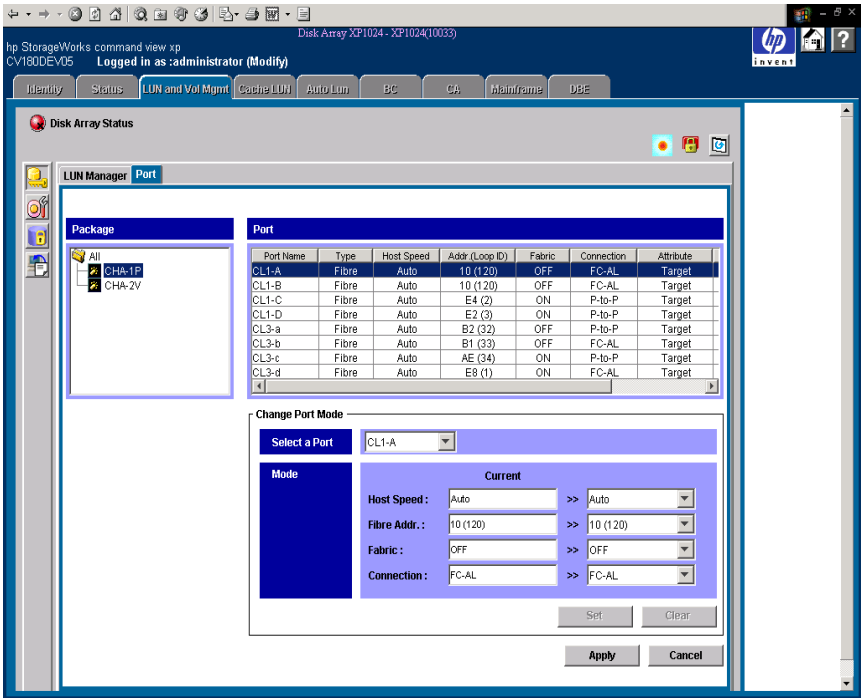


Setting the System Option Modes

The HP representative sets the System Option Mode(s) based on the operating system and software configuration of the host.

Configuring the Fibre Channel ports

Configure the disk array Fibre Channel ports by using Command View (shown) or the Fibre Parameter window in LUN Configuration Manager. Select the settings for each port based on your storage area network topology. Use switch zoning if you connect different types of hosts to the array through the same switch.

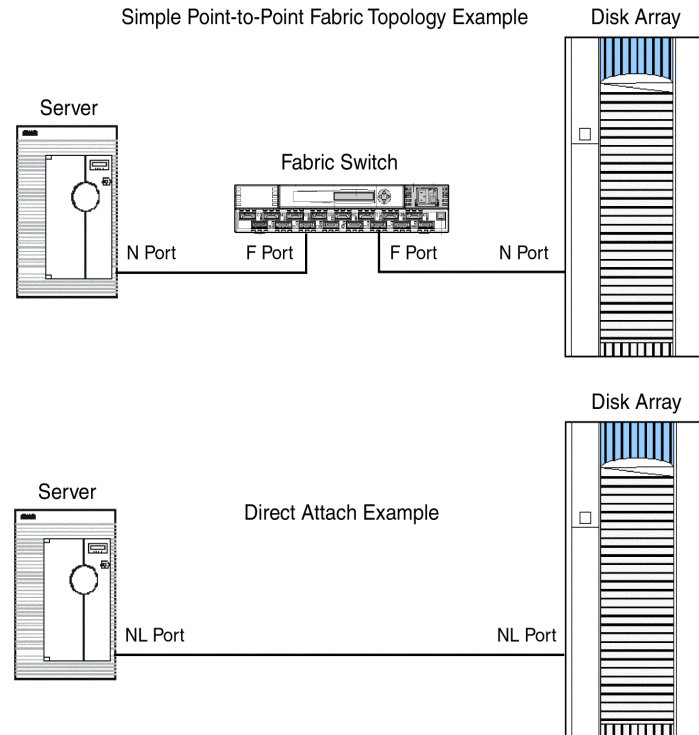


Fibre Address

In fabric environments, the port addresses are assigned automatically. In arbitrated loop environments, you set the port addresses by selecting a unique arbitrated loop physical address (AL-PA) or loop ID for each port.

Fabric and Connection parameter settings

You can set each array port to FABRIC ON or OFF with connections of POINT-TO-POINT or FC-AL as shown in the following table and figures. For detailed topology information, refer to the *HP StorageWorks SAN Design Reference Guide* on the hp.com website.



Fabric Parameter	Connection Parameter	Provides
ON	FC-AL	Not supported
ON	Point-to-Point	N-port (SAN fabric port)
OFF	FC-AL	AL-port (private arbitrated loop; direct connect without a SAN)
OFF	Point-to-Point	Not supported

Install and configure the host

Install and configure the host and host bus adapters (HBAs) that connect the host to the disk array.

Loading the OS and software

Follow the manufacturer's instructions to load the operating system and software onto the host. Load all OS patches and configuration utilities supported by HP and the HBA manufacturer.

Connecting the Fibre Channel adapters and cabling

After you have configured the Fibre Channel ports, you are ready to connect the disk array to the host systems.

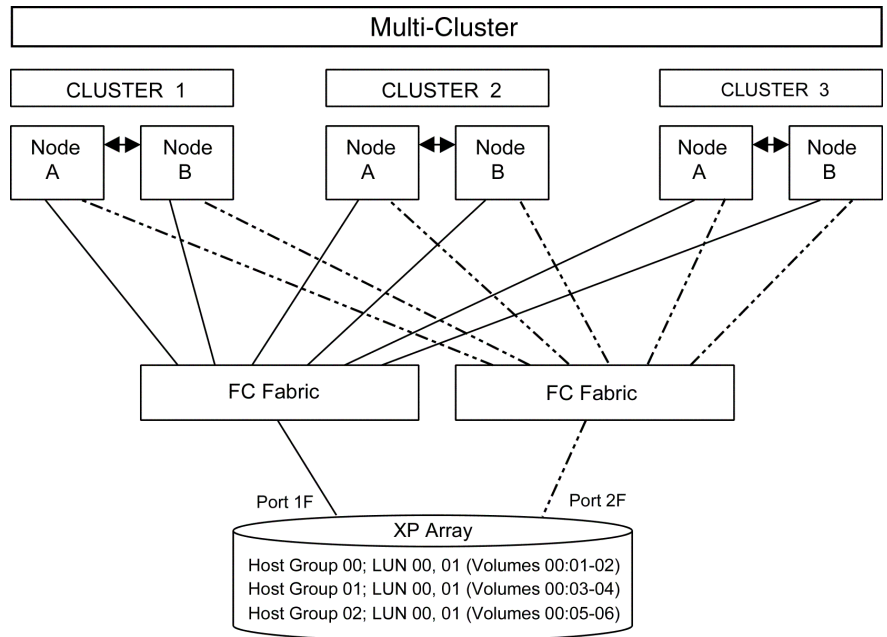
Installing and configuring the HBAs

Install and configure the host bus adapters using the HBA manufacturer's instructions.

For Linux, the disk array only supports QLogic and Emulex adapters. Contact your HP service representative for the latest supported host bus adapter card (HBA) information.

Clustering and Fabric zoning

If you plan to use clustering, install and configure the clustering software on the servers. Clustering is the organization of multiple servers into groups. Within a cluster, each server is a node. Multiple clusters compose a multi-cluster environment. The following example shows a multi-cluster environment with three clusters, each containing two nodes. The nodes share access to the disk array.



Within the Storage Area Network (SAN), the clusters may be homogeneous (all the same operating system) or they may be heterogeneous (mixed operating systems). How you configure LUN Security and fabric zoning depends on the operating system mix and the SAN configuration.

Fabric zoning and LUN security for multiple operating systems

By using appropriate zoning and LUN security, you can connect multiple clusters of various operating systems to the same switch and fabric:

- Host zones must contain only homogeneous operating systems.
- Storage port zones may overlap if more than one operating system needs to share an array port.
- Heterogeneous operating systems may share an XP array port if you use Secure Manager and set the appropriate host group and mode; all others must connect to a dedicated XP array port.
- Use Secure Manager for LUN isolation when multiple hosts connect through a shared array port. Secure Manager provides LUN security by allowing you to restrict which LUNs each host can access.

Environment	OS Mix	Fabric Zoning	LUN Security
Standalone SAN (non-clustered)	homogeneous (a single OS type present in the SAN)	Not required	Must be used when multiple hosts connect through a shared port
	heterogeneous (more than one OS type present in the SAN)	Required	
Clustered SAN	homogeneous (a single OS type present in the SAN)	Not required	Must be used when multiple cluster nodes connect through a shared port
	heterogeneous (more than one OS type present in the SAN)	Required	
Multi-Cluster SAN	homogeneous (a single OS type present in the SAN)	Not required	Must be used when multiple cluster nodes connect through a shared port
	heterogeneous (more than one OS type present in the SAN)	Required	

Connect the disk array

Connect the disk array to the host as follows:

1. The HP service representative verifies operational status of the disk array channel adapters, LDEVs, and paths.
2. The HP representative connects the Fibre Channel cables between the disk array and the fabric or host.

Restarting the Linux server

After fiber cables are connected and the HBA driver is installed, it is recommended that you restart the Linux server.

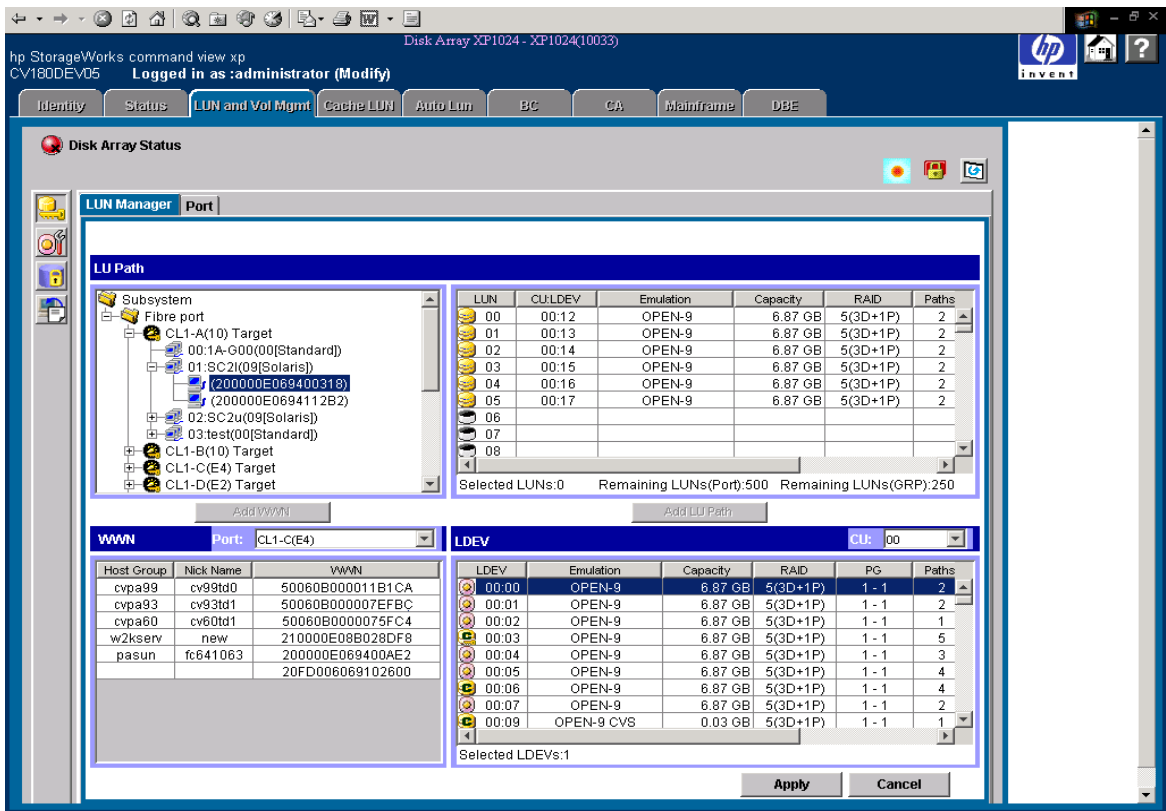
1. Power on the display of the Linux server.
2. Power on all devices other than the disk array.
3. Confirm ready status of all devices.
4. Power on the Linux server.

Defining the paths

Use Command View (shown) or LUN Configuration Manager to create paths (LUNs) between hosts and volumes in the disk array, also called LUN mapping. LUN mapping includes these tasks:

- Configuring ports
- Setting LUN security
- Creating host groups by operating system and setting their host modes
- Assigning host bus adapter WWNs to host groups.
- Mapping volumes to host groups (by assigning LUNs).

For details, see the Command View or LUN Configuration Manager guide. HP recommends that you note LUNS and their ports, WWNs, nicknames, and LDEVs for later use in verifying host and device configuration.



Verifying new device recognition

1. Verify that the HBA driver is installed using the **lsmod** command.
2. Display device information by viewing the `/proc/scsi/scsi` file.

Example **#cat /proc/scsi/scsi**

```
Attached devices:
Host: scsi0 Channel: 00 Id: 00 Lun: 00
  Vendor: HP          Model: OPEN-9          Rev: 2105
  Type:   Direct-Access          ANSI SCSI revision: 02
Host: scsi0 Channel: 00 Id: 00 Lun: 01
  Vendor: HP          Model: OPEN-9          Rev: 2105
  Type:   Direct-Access          ANSI SCSI revision: 02
Host: scsi0 Channel: 00 Id: 00 Lun: 02
  Vendor: HP          Model: OPEN-9          Rev: 2105
  Type:   Direct-Access          ANSI SCSI revision: 02
Host: scsi0 Channel: 00 Id: 00 Lun: 03
  Vendor: HP          Model: OPEN-9          Rev: 2105
  Type:   Direct-Access          ANSI SCSI revision: 02
Host: scsi0 Channel: 00 Id: 00 Lun: 04
  Vendor: HP          Model: OPEN-9          Rev: 2105
  Type:   Direct-Access          ANSI SCSI revision: 02
Host: scsi0 Channel: 00 Id: 00 Lun: 05
  Vendor: HP          Model: OPEN-9          Rev: 2105
  Type:   Direct-Access          ANSI SCSI revision: 02
Host: scsi0 Channel: 00 Id: 00 Lun: 06
  Vendor: HP          Model: OPEN-9          Rev: 2105
  Type:   Direct-Access          ANSI SCSI revision: 02
```

3. Verify that the system recognizes the disk array partitions by viewing the `/proc/partitions` file.

Example

#cat	/proc/partitions	major	minor	#blocks	name	rio	rmerge	rsect	ruse	wio	wmerge	wng	use	aveq		
8	0	7211520	sda	1	3	8	10	0	0	0	0	0	0	10	10	
8	1	7181087	sda1	0	0	0	0	0	0	0	0	0	0	0	0	
8	2	28272	sda2	0	0	0	0	0	0	0	0	0	0	0	0	
8	16	7211520	sdb	1	3	8	10	0	0	0	0	0	0	10	10	
8	17	7181087	sdb1	0	0	0	0	0	0	0	0	0	0	0	0	
8	18	28272	sdb2	0	0	0	0	0	0	0	0	0	0	0	0	
8	32	7211520	sd	1	3	8	10	0	0	0	0	0	0	10	10	
8	33	7181087	sd	0	0	0	0	0	0	0	0	0	0	0	0	
8	34	28272	sd	0	0	0	0	0	0	0	0	0	0	0	0	
8	48	7211520	sdd	1	3	8	0	0	0	0	0	0	0	0	0	
8	49	7181087	sdd1	0	0	0	0	0	0	0	0	0	0	0	0	
8	50	28272	sdd2	0	0	0	0	0	0	0	0	0	0	0	0	
8	64	7211520	sde	1	3	8	10	0	0	0	0	0	0	10	10	
8	65	7181087	sde1	0	0	0	0	0	0	0	0	0	0	0	0	
8	66	28272	sde2	0	0	0	0	0	0	0	0	0	0	0	0	
8	80	7211520	sdf	1	3	8	1010	0	0	0	0	0	0	1010	1010	
8	81	7173022	sdf1	0	0	0	0	0	0	0	0	0	0	0	0	
8	82	32130	sdf2	0	0	0	0	0	0	0	0	0	0	0	0	
8	96	7211520	sdg	1	3	8	10	0	0	0	0	0	0	10	10	
8	97	7173022	sdg1	0	0	0	0	0	0	0	0	0	0	0	0	
104	0	17776560	cciss/c0d0	168200	352184	4166792	476800	77917	148348	182492	2478520	0	377350	2955230		
104	1	257024	cciss/c0d0p1	1	3	8	10	0	0	0	0	0	0	0	0	
104	2	1048560	cciss/c0d0p2	2	3	16	10	0	0	0	0	0	0	10	10	
104	3	16470960	cciss/c0d0p3	168193	352166	4166736	476810	77917	148348	182	912	2478520	0377320	2955150		

In the above example, the “sd” devices represent the XP disk partitions and the “cciss” devices represent the internal hard drive partitions on an HP Proliant system.

Configure disk array devices

Configure the disk array devices in the same way you would configure any new disk on the host. Creating scripts to configure all devices at once may save you considerable time.

Configure the disk array devices in the same way you would configure any new disk on the host. Creating scripts to configure all devices at once may save you considerable time.

1. Partition each device.
2. Create a file system for each device.
3. Create a mount directory for each device.
4. Add mount table entries for the devices.
5. Verify file system operation by copying a file to each device.

Partition the devices

After the device parameters have been changed, you can set the partitions.

To partition the devices:

1. Enter **fdisk/dev/device_name**.

Example

fdisk/dev/sda

2. Select **p** to display the present partitions.
3. Select **n** to make a new partition. You can make up to four primary partitions, or as an alternative, you can make one extended partition. The extended partition can be divided into a maximum of 11 logical partitions, which can be assigned partition numbers from 5 to 15.
4. Select **w** to write the partition information to disk and complete the **fdisk** command.
5. Other commands that you might want to use include:
To remove partitions, select **d**.
To stop a change, select **q**.
6. Repeat the above steps for each device.

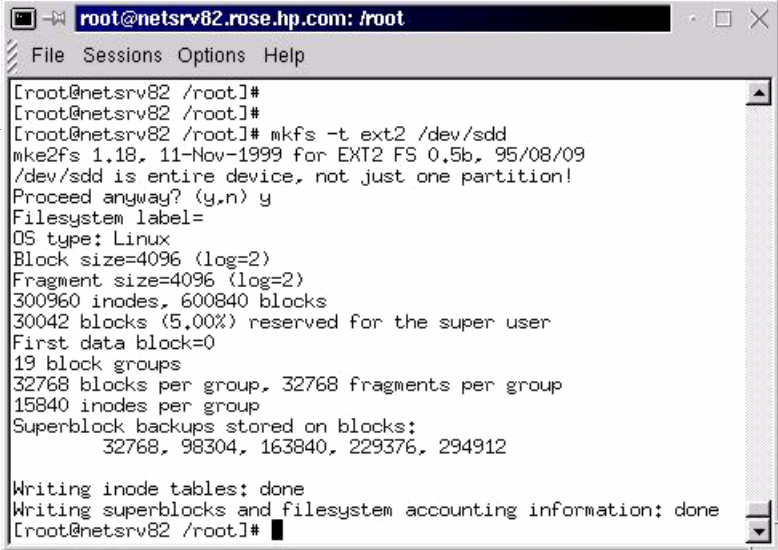
Create the file systems

Supported file systems for Linux include ext2 and ext3.

Creating file systems with ext2

1. Enter **mkfs -t ext2 /dev/device_name**.

Example **# mkfs -t ext2 /dev/sdd**



A terminal window titled "root@netsrv82.rose.hp.com: /root" with a menu bar (File, Sessions, Options, Help). The terminal shows the following output:

```
[root@netsrv82 /root]#  
[root@netsrv82 /root]#  
[root@netsrv82 /root]# mkfs -t ext2 /dev/sdd  
mke2fs 1.18, 11-Nov-1999 for EXT2 FS 0.5b, 95/08/09  
/dev/sdd is entire device, not just one partition!  
Proceed anyway? (y,n) y  
Filesystem label=  
OS type: Linux  
Block size=4096 (log=2)  
Fragment size=4096 (log=2)  
300960 inodes, 600840 blocks  
30042 blocks (5.00%) reserved for the super user  
First data block=0  
19 block groups  
32768 blocks per group, 32768 fragments per group  
15840 inodes per group  
Superblock backups stored on blocks:  
    32768, 98304, 163840, 229376, 294912  
  
Writing inode tables: done  
Writing superblocks and filesystem accounting information: done  
[root@netsrv82 /root]#
```

An arrow points to the command line where the `mkfs` command is entered.

2. Repeat step 1 for each device on the disk array.

Create the mount directories

Create mount directories using the **mkdir** command. Choose names for the mount directories which identify both the logical volume or partition.

- 1. Enter **mkdir /mnt/mount_point**.

Example **# mkdir /mnt/A5700F_LU00**

- 2. Repeat step 1 for each device on the disk array.

Create the mount table

Add the new devices to the **/etc/fstab** file to specify the auto-mount parameters for each device.

- 1. Edit the **/etc/fstab** file to add one line for each device to be auto-mounted.

Each line of the file contains the device name (A), the mount point (B), the file system type (**ext2**) (C), mount options (**defaults**) (D), enhance parameter 1, and **fsck** pass 2 (E).

Example **# vi /etc/fstab**

/dev/sdb	/A5700F_ID08	ext2	defaults 1 2
/dev/sdc	/A5700F_ID09	ext2	defaults 1 2
/dev/sdd	/A5700F_ID10	ext2	defaults 1 2
A	B	C	D E

- 2. After making an entry for each device, save the file and exit the editor.
- 3. Reboot the host system.
- 4. Display the mounted devices using the **df -h** command, and verify that the devices were auto-mounted.

Example **# df -h**

Filesystem	Size	Used	Avail	Used%	Mounted on
/dev/sda1	1.8G	890M	866M	51%	/
/dev/sdb1	1.9G	1.0G	803M	57%	/usr
/dev/sdc1	2.2G	13k	2.1G	0%	/A5700F-LU00
#					

Troubleshooting

If you encounter an error condition, see [“Error conditions” on page 32](#) for recommended actions.

If you are unable to resolve an error condition, ask your HP support representative for assistance. See [“Calling the HP support center” on page 34](#).

Error conditions

Error Condition	Recommended Action
The logical devices are not recognized by the host.	<p>Verify that the READY indicator lights on the disk array are ON.</p> <p>Verify that fiber cables are correctly installed and firmly connected.</p> <p>Verify that the target IDs are properly configured. The LUNs for each TID must start at 0 and continue sequentially without skipping any numbers.</p> <p>Verify that the TIDs/WWNs on each bus are unique. Do not install two devices with the same ID on the same bus.</p> <p>Recheck the buses for new devices.</p> <p>Verify that LUSE devices are not intermixed with normal LUNs on the same port.</p> <p>Verify that the maximum number of LUSE devices per port has not been exceeded.</p> <p>Verify that the disk array Host Mode is set correctly.</p>
The host does not reboot properly after hard shutdown.	<p>If you power off the host without executing the shutdown process, wait three minutes to allow the disk array's internal timeout process to purge queued commands. If the host restarts while the disk array is processing queued commands, the host may not reboot successfully.</p>
Physical volumes cannot be created.	<p>Verify that the disk array logical devices are correctly formatted.</p>
Logical volumes cannot be created.	<p>Verify that the volume capacity for OPEN-x volumes is not greater than the maximum capacity allowed. See the Device Emulations Appendix.</p> <p>Verify that the capacity of the volume group is not less than the total capacity of the partitioned logical volume.</p>

Error Condition	Recommended Action
A file system is not mounted after rebooting.	<p>Verify that the host was restarted correctly.</p> <p>Verify that the file system attributes are correct.</p>
The disk array performs a self reboot because the disk array was busy or it logged a panic message.	Reboot the host.
The disk array responds “Not Ready” or the disk array has displayed “Not Ready” and timed out.	Contact HP.
The host detects a parity error.	<p>Check the HBA and make sure it was installed properly.</p> <p>Reboot the host.</p>
The host hangs or devices are declared and the host hangs.	Make sure there are no duplicate disk array TIDs and that disk array TIDs do not conflict with any host TIDs.

Calling the HP support center

If you need to call HP customer support, provide as much information about the problem as possible, including the circumstances of the error or failure and the exact content of any error messages.

Depending on your system configuration, you may be able to view error messages as follows:

- View SIMs in Command View (Device Health tab).
- View R-SIMs in Remote Control XP, including reference codes and severity levels of recent R-SIMs.
- View SIMs that generate SNMP traps on the host.

A

Worksheet

Path worksheet

LDEV (CU:LDEV) (CU = control unit)	Device Type	SCSI Bus Number	Path 1	Alternate Paths		
0:00				TID: LUN:	TID: LUN:	TID: LUN:
0:01				TID: LUN:	TID: LUN:	TID: LUN:
0:02				TID: LUN:	TID: LUN:	TID: LUN:
0:03				TID: LUN:	TID: LUN:	TID: LUN:
0:04				TID: LUN:	TID: LUN:	TID: LUN:
0:05				TID: LUN:	TID: LUN:	TID: LUN:
0:06				TID: LUN:	TID: LUN:	TID: LUN:
0:07				TID: LUN:	TID: LUN:	TID: LUN:
0:08				TID: LUN:	TID: LUN:	TID: LUN:
0:09				TID: LUN:	TID: LUN:	TID: LUN:
0:10				TID: LUN:	TID: LUN:	TID: LUN:
0:11				TID: LUN:	TID: LUN:	TID: LUN:
0:12				TID: LUN:	TID: LUN:	TID: LUN:
0:13				TID: LUN:	TID: LUN:	TID: LUN:

Disk array device emulations

This appendix provides information about disk array supported emulations and device type specifications. Some parameters may not be relevant to your array. Consult your HP representative for information about supported configurations for your system.

Supported emulations

XP Model	OPEN Emulation Type	OPEN Emulation Supported	LUSE	CVS	LUSE & CVS
XP48 XP512	OPEN-3	Yes	Yes	Yes	Yes
	OPEN-8	Yes	Yes	Yes	Yes
	OPEN-9	Yes	Yes	Yes	Yes
	OPEN-E	Yes	Yes	Yes	Yes
	OPEN-K	Yes	Yes	Yes	Yes
	OPEN-L	Yes	Yes		
	OPEN-M	Yes	Yes		
	OPEN-V				
XP128 XP1024 XP12000	OPEN-3	Yes	Yes	Yes	Yes
	OPEN-8	Yes	Yes	Yes	Yes
	OPEN-9	Yes	Yes	Yes	Yes
	OPEN-E	Yes	Yes	Yes	Yes
	OPEN-K				
	OPEN-L	Yes	Yes		
	OPEN-M				
	OPEN-V	Yes	Yes		

Device type specifications

Device Type (Note 1)	Category (Note 2)	Blocks (512 bytes)	Sector Size (bytes)	# of Cylinders	Heads	Sectors per Track	Capacity MB* (Note 3)
OPEN-3	SCSI disk	4806720	512	3338	15	96	2347
OPEN-8	SCSI disk	14351040	512	9966	15	96	7007
OPEN-9	SCSI disk	14423040	512	10016	15	96	7042
OPEN-E	SCSI disk	28452960	512	19759	15	96	13893
OPEN-L	SCSI disk	71192160	512	49439	15	96	34761
OPEN-V	SCSI disk	max=125827200	512	Note 5	15	128	Note 6
LUSE							
OPEN-3*n	SCSI disk	4806720*n	512	3338*n	15	96	2347*n
OPEN-8*n	SCSI disk	14351040*n	512	9966*n	15	96	7007*n
OPEN-9*n	SCSI disk	14423040*n	512	10016*n	15	96	7042*n
OPEN-E*n	SCSI disk	28452960*n	512	19759*n	15	96	13893*n
OPEN-L*n	SCSI disk	71192160*n	512	49439*n	15	96	34761*n
OPEN-V*n	SCSI disk	max=125827200 Note 4	512	Note 5	15	128	Note 6
CVS							
OPEN-3 CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-8 CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-9 CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-E CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
CVS LUSE							
OPEN-3*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-8*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-9*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-E*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-V*n	SCSI disk	Note 4	512	Note 5	15	128	Note 6

*Capacity = (512 x number of blocks) ÷ 1024²

Note 1: The availability of a disk type depends on the disk array.

Note 2: The devices are defined to the host as SCSI disk devices, even though the interface is Fibre Channel.

Note 3: The device capacity can sometimes be changed by the BIOS or host adapter board. This may make actual capacity different from that listed in the table.

Note 4: The number of blocks for a CVS volume is calculated as follows:
of blocks = (# of cylinders) × (# of heads) × (# of sectors per track)

Example 1: For an OPEN-3 CVS volume with capacity = 37 MB:
of blocks = (53 cylinders—see Note 5) × (15 heads) × (96 sectors per track) = 76320

Example 2: For an OPEN-V CVS volume with capacity = 49 MB:
of blocks = (53 cylinders—see Note 5) × (15 heads) × (128 sectors per track) = 101760

Note 5: The number of cylinders for a CVS volume is calculated as follows (\uparrow ... \uparrow means that the value should be rounded up to the next integer):

OPEN-3/8/9/E: The number of cylinders for a CVS volume =
of cylinders = \uparrow (capacity (MB) specified by user) × 1024/720 \uparrow

Example: For an OPEN-3 CVS volume with capacity = 37 MB:
of cylinders = $\uparrow 37 \times 1024/720 \uparrow = \uparrow 52.62 \uparrow$ (rounded up to next integer) = 53 cylinders

OPEN-V: The number of cylinders for a CVS volume =
of cylinders = \uparrow (capacity (MB) specified by user) × 16/15 \uparrow

Example: For an OPEN-V CVS volume with capacity = 49 MB:
of cylinders = $\uparrow 49 \times 16/15 \uparrow = \uparrow 52.26 \uparrow$ (rounded up to next integer) = 53 cylinders

OPEN-3/8/9/E: The number of cylinders for a CVS LUSE volume =
of cylinders = \uparrow (capacity (MB) specified by user) × 1024/720 $\uparrow \times n$

Example: For a CVS LUSE volume with capacity = 37 MB and $n = 4$
of cylinders = $\lceil 37 \times 1024 / 720 \rceil \times 4 = \lceil 52.62 \rceil \times 4 = 53 \times 4 = 212$

OPEN-V: The number of cylinders for a CVS LUSE volume =
of cylinders = $\lceil (\text{capacity (MB) specified by user}) \times 16 / 15 \rceil \times n$

Example: For an OPEN-V CVS LUSE volume with capacity = 49 MB and $n = 4$
of cylinders = $\lceil 49 \times 16 / 15 \rceil \times 4 = \lceil 52.26 \rceil \times 4 = 53 \times 4 = 212$

Note 6: The capacity of an OPEN-3/8/9/E CVS volume is specified in MB, not number of cylinders. The capacity of an OPEN-V CVS volume can be specified in MB or number of cylinders. You set the volume size using the LUN Configuration Manager or Command View software.

Glossary

AL	Arbitrated loop.
AL-PA	Arbitrated loop physical address.
BC	HP StorageWorks Business Copy XP. BC lets you maintain up to nine local copies of logical volumes on the disk array.
CA	HP StorageWorks Continuous Access XP. CA lets you create and maintain duplicate copies of local logical volumes on a remote disk array.
Command View	HP StorageWorks Command View XP, a software product for managing XP arrays. Command View runs on a Windows-based management workstation.
command device	An LDEV that transfers RAID commands to BC or CA logical volumes.
CVS	CVS devices (OPEN-x CVS) are custom volumes that are smaller than normal fixed-sized logical disk devices (volumes).
DKC (disk controller unit)	The array cabinet that houses the channel adapters and service processor (SVP).
DKU (disk cabinet unit)	The array cabinets that house the disk array physical disks.
emulation modes	Emulation modes can be assigned to LDEVs to make them operate like standard OPEN system disk drives. The emulation mode of an LDEV determines its capacity. Refer to the appendices for device capacities.
FC	Fibre Channel.

FC-AL	Fibre Channel arbitrated loop.
FCP	Fibre Channel Protocol.
HBA	Host bus adapter.
HP	Hewlett-Packard Company.
LDEV	Logical device. An LDEV is created when a RAID group is divided into sections using a selected host emulation mode (for example, OPEN-9 or OPEN-M). The number of resulting LDEVs depends on the emulation mode. “LDEV” and “volume” are synonyms.
LUN	Logical unit number. A LUN results from mapping a SCSI logical unit number, port ID, and LDEV ID to a RAID group. The size of the LUN is determined by the emulation mode of the LDEV and the number of LDEVs associated with the LUN. For example, a LUN associated with two OPEN-3 LDEVs has a size of 4,693 MB.
LUSE	Logical Unit Size Expansion, a feature which logically combines LDEVs so they appear as a larger LDEV. This allows a LUN to be associated with 2 to 36 LDEVs. LUSE allows applications to access data requiring large amounts of disk space.
OFC	Open Fibre Control.
OPEN-x	A general term describing any one of the supported OPEN emulation modes (for example, OPEN-L).
OS	Operating system.
PA	Physical address.
path	“Path” and “LUN” are synonymous. Paths are created by associating a port, a target, and a LUN ID with one or more LDEVs.
port	A connector on a channel adapter card in the disk array. A port passes data between the disk array and external devices, such as a host server. Ports are named using a port group and port letter, for example, CL1-A.

RAID	Redundant array of independent disks.
remote console PC	The PC running HP StorageWorks Remote Control XP.
Remote Control (RC)	HP StorageWorks Remote Control XP. A software product used for managing XP arrays.
R-SIM	Remote service information message.
SCSI	Small computer system interface.
SIM	Service information message.
SNMP	Simple Network Management Protocol.
SVP	Service processor. A notebook computer built into the disk array. The SVP provides a direct interface to the disk array and is used only by the HP service representative.
TID	Target ID.
VSC	Volume Size Configuration is a feature that defines custom volumes (CVS volumes) that are smaller than normal fixed-sized logical disk devices (volumes).
WWN	World Wide Name. A unique identifier assigned to a Fibre Channel device.

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